SEQUENCE LISTING

<110> THE JOHNS HOPKINS UNIVERSITY SCHOOL OF MEDICINE
LEE, Se-Jin
ESQUELA, Aurora F.

<120> METHODS OF DETECTING LIVER CELLS EXPRESSING GROWTH DIFFERENTIATION
FACTOR-12

<130> JHU1220-4

<140> US 09/361,655
<141> 1999-07-27

<150> US 08/765,662
<151> 1997-04-28

<150> PCT/ US95/08745
<151> 1995-07-12

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<151> 1994-07-13

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<170> PatentIn version 3.1

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Cys Arg Arg Asp His Tyr Val Asp Phe Gln Glu Leu Gly Trp Arg Asp
            20              25              30

tgg ata ctg cag ccc gag ggg tac cag ctg aat tac tgc agt ggg cag   144
Trp Ile Leu Gln Pro Glu Gly Tyr Gln Leu Asn Tyr Cys Ser Gly Gln
        35              40              45

tgc cct ccc cac ctg gct ggc agc cca ggc att gct gcc tct ttc cat   192
Cys Pro Pro His Leu Ala Gly Ser Pro Gly Ile Ala Ala Ser Phe His
    50              55              60

tct gcc gtc ttc agc ctc ctc aaa gcc aac aat cct tgg cct gcc agt   240
Ser Ala Val Phe Ser Leu Leu Lys Ala Asn Asn Pro Trp Pro Ala Ser
65              70              75              80

acc tcc tgt tgt gtc cct act gcc cga agg ccc ctc tct ctc ctc tac   288
Thr Ser Cys Cys Val Pro Thr Ala Arg Arg Pro Leu Ser Leu Leu Tyr
            85              90              95

ctg gat cat aat ggc aat gtg gtc aag acg gat gtg cca gat atg gtg   336
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Trp Ile Leu Gln Pro Glu Gly Tyr Gln Leu Asn Tyr Cys Ser Gly Gln
        35              40              45

Cys Pro Pro His Leu Ala Gly Ser Pro Gly Ile Ala Ala Ser Phe His
    50              55              60

Ser Ala Val Phe Ser Leu Leu Lys Ala Asn Asn Pro Trp Pro Ala Ser
65              70              75              80

Thr Ser Cys Cys Val Pro Thr Ala Arg Arg Pro Leu Ser Leu Leu Tyr
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atccgaggct cctgaaccag ggccattcac caggagc atg cgg ctc cct gat gtc          235
                                          Met Arg Leu Pro Asp Val
                                           1               5

cag ctc tgg ctg gtg ctg ctg tgg gca ctg gtg cga gca cag ggg aca          283
Gln Leu Trp Leu Val Leu Leu Trp Ala Leu Val Arg Ala Gln Gly Thr
             10              15                  20

ggg tct gtg tgt ccc tcc tgt ggg ggc tcc aaa ctg gca ccc caa gca          331
Gly Ser Val Cys Pro Ser Cys Gly Gly Ser Lys Leu Ala Pro Gln Ala
             25              30                  35

gaa cga gct ctg gtg ctg gag cta gcc aag cag caa atc ctg gat ggg          379
Glu Arg Ala Leu Val Leu Glu Leu Ala Lys Gln Gln Ile Leu Asp Gly
 40              45                  50

ttg cac ctg acc agt cgt ccc aga ata act cat cct cca ccc cag gca          427
Leu His Leu Thr Ser Arg Pro Arg Ile Thr His Pro Pro Pro Gln Ala
55              60                  65                  70

gcg ctg acc aga gcc ctc cgg aga cta cag cca ggg agt gtg gct cca          475
Ala Leu Thr Arg Ala Leu Arg Arg Leu Gln Pro Gly Ser Val Ala Pro
             75                  80                  85

ggg aat ggg gag gag gtc atc agc ttt gct act gtc aca gac tcc act          523
Gly Asn Gly Glu Glu Val Ile Ser Phe Ala Thr Val Thr Asp Ser Thr
             90                  95                  100

tca gcc tac agc tcc ctg ctc act ttt cac ctg tcc act cct cgg tcc          571
Ser Ala Tyr Ser Ser Leu Leu Thr Phe His Leu Ser Thr Pro Arg Ser
             105                 110                 115

cac cac ctg tac cat gcc cgc ctg tgg ctg cac gtg ctc ccc acc ctt          619
His His Leu Tyr His Ala Arg Leu Trp Leu His Val Leu Pro Thr Leu
             120                 125                 130

cct ggc act ctt tgc ttg agg atc ttc cga tgg gga cca agg agg agg          667
Pro Gly Thr Leu Cys Leu Arg Ile Phe Arg Trp Gly Pro Arg Arg Arg
135                 140                 145                 150

cgc caa ggg tcc cgc act ctc ctg gct gag cac cac atc acc aac ctg          715
Arg Gln Gly Ser Arg Thr Leu Leu Ala Glu His His Ile Thr Asn Leu
             155                 160                 165

ggc tgg cat acc tta act ctg ccc tct agt ggc ttg agg ggt gag aag          763
Gly Trp His Thr Leu Thr Leu Pro Ser Ser Gly Leu Arg Gly Glu Lys
             170                 175                 180

tct ggt gtc ctg aaa ctg caa cta gac tgc aga ccc cta gaa ggc aac          811
Ser Gly Val Leu Lys Leu Gln Leu Asp Cys Arg Pro Leu Glu Gly Asn
             185                 190                 195

agc aca gtt act gga caa ccg agg cgg ctc ttg gac aca gca gga cac          859
Ser Thr Val Thr Gly Gln Pro Arg Arg Leu Leu Asp Thr Ala Gly His
             200                 205                 210

cag cag ccc ttc cta gag ctt aag atc cga gcc aat gag cct gga gca          907
Gln Gln Pro Phe Leu Glu Leu Lys Ile Arg Ala Asn Glu Pro Gly Ala
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         215                     220                     225                     230
ggc cgg gcc agg agg agg acc ccc acc tgt gag cct gcg acc ccc tta       955
Gly Arg Ala Arg Arg Arg Thr Pro Thr Cys Glu Pro Ala Thr Pro Leu
                    235                     240                     245

tgt tgc agg cga gac cat tac gta gac ttc cag gaa ctg gga tgg cgg      1003
Cys Cys Arg Arg Asp His Tyr Val Asp Phe Gln Glu Leu Gly Trp Arg
            250                     255                     260

gac tgg ata ctg cag ccc gag ggg tac cag ctg aat tac tgc agt ggg      1051
Asp Trp Ile Leu Gln Pro Glu Gly Tyr Gln Leu Asn Tyr Cys Ser Gly
            265                     270                     275

cag tgc cct ccc cac ctg gct ggc agc cca ggc att gct gcc tct ttc      1099
Gln Cys Pro Pro His Leu Ala Gly Ser Pro Gly Ile Ala Ala Ser Phe
        280                     285                     290

cat tct gcc gtc ttc agc ctc ctc aaa gcc aac aat cct tgg cct gcc      1147
His Ser Ala Val Phe Ser Leu Leu Lys Ala Asn Asn Pro Trp Pro Ala
295                     300                     305                     310

agt acc tcc tgt tgt gtc cct act gcc cga agg ccc ctc tct ctc ctc      1195
Ser Thr Ser Cys Cys Val Pro Thr Ala Arg Arg Pro Leu Ser Leu Leu
                315                     320                     325

tac ctg gat cat aat ggc aat gtg gtc aag acg gat gtg cca gat atg      1243
Tyr Leu Asp His Asn Gly Asn Val Val Lys Thr Asp Val Pro Asp Met
                330                     335                     340

gtg gtg gag gcc tgt ggc tgc agc tagcaagagg acctggggct ttggagtgaa     1297
Val Val Glu Ala Cys Gly Cys Ser
            345                     350

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cctgtgagaa gatgtcaggg actagggagg gagggaggga aggcagagaa aaattactta    1597

gcctctccca agatgagaaa gtcctcaagt gaggggagga ggaagcagat agatggtcca    1657

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cgtctcctgg gttcaagtga ttcttctgcc tcagcctccc gagcagctgg gattacaggc    2017

gcccactaat ttttgtattc ttagtagaaa cgaggtttca acatgttggc caggatggtc    2077

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gtaggcttct gggaggtccc ttttcagggg tgtccacaaa gtcaaagcta ttttcataat    2317

aatactaaca tgttatttgc cttttgaatt ctcattatct taaaattgta ttgtggagtt    2377

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Lys Leu Ala Pro Gln Ala Glu Arg Ala Leu Val Leu Glu Leu Ala Lys
        35                  40                  45


Gln Gln Ile Leu Asp Gly Leu His Leu Thr Ser Arg Pro Arg Ile Thr
    50                  55                  60


His Pro Pro Pro Gln Ala Ala Leu Thr Arg Ala Leu Arg Arg Leu Gln
65                  70                  75                  80


Pro Gly Ser Val Ala Pro Gly Asn Gly Glu Glu Val Ile Ser Phe Ala
            85                  90                  95


Thr Val Thr Asp Ser Thr Ser Ala Tyr Ser Ser Leu Leu Thr Phe His
            100                 105                 110


Leu Ser Thr Pro Arg Ser His His Leu Tyr His Ala Arg Leu Trp Leu
        115                 120                 125


His Val Leu Pro Thr Leu Pro Gly Thr Leu Cys Leu Arg Ile Phe Arg
    130                 135                 140


Trp Gly Pro Arg Arg Arg Gln Gly Ser Arg Thr Leu Leu Ala Glu
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His His Ile Thr Asn Leu Gly Trp His Thr Leu Thr Leu Pro Ser Ser
                165                 170                 175
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Arg Pro Leu Glu Gly Asn Ser Thr Val Thr Gly Gln Pro Arg Arg Leu
            195                 200                 205

Leu Asp Thr Ala Gly His Gln Gln Pro Phe Leu Glu Leu Lys Ile Arg
            210                 215                 220

Ala Asn Glu Pro Gly Ala Gly Arg Ala Arg Arg Thr Pro Thr Cys
225                 230                 235                 240

Glu Pro Ala Thr Pro Leu Cys Cys Arg Arg Asp His Tyr Val Asp Phe
                245                 250                 255

Gln Glu Leu Gly Trp Arg Asp Trp Ile Leu Gln Pro Glu Gly Tyr Gln
            260                 265                 270

Leu Asn Tyr Cys Ser Gly Gln Cys Pro Pro His Leu Ala Gly Ser Pro
            275                 280                 285

Gly Ile Ala Ala Ser Phe His Ser Ala Val Phe Ser Leu Leu Lys Ala
            290                 295                 300

Asn Asn Pro Trp Pro Ala Ser Thr Ser Cys Cys Val Pro Thr Ala Arg
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Thr Asp Val Pro Asp Met Val Val Glu Ala Cys Gly Cys Ser
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